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ABSTRACT

This paper describes a training program which was designed to train teachers how to use computer applications such as database management systems and spreadsheets in their classrooms; how to modify applications according to their teaching practices; and how to learn from their experiences in using computer applications in the classroom. A group of 14 secondary science teachers participated in the program, which lasted for 25 days and included 10 days of training in computer science literacy and 13 days working in groups to develop software for teaching science and integrating the computer as a tool in their classroom practices. The training was also intended to help teachers recognize their own underlying theoretical constructs and to choose appropriate software that would mirror those constructs. In their efforts to accomplish these goals, teachers paid particular attention to their own learning processes, and to their role as manager of an educational environment. Also discussed is the "accompanying" role of the training of trainers during the development process, including the management of teachers' affective and cognitive resistance to changes in their practices required by the use of new media. (DB)

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DEVELOPMENT PROCESS OF PEDAGOGICAL USES
OF APPLICATION SOFTWARES AS ANALYZER OF
TEACHERS PRACTICE

by

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March 1990

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DEVELOPMENT PROCESS OF PEDAGOGICAL USES OF APPLICATION SOFTWARES AS ANALYZER OF TEACHERS PRACTICE

B. Hauglustaine - Charlier *

ABSTRACT

The uses of application softwares as learning tools seem to be an alternative to the traditional computer assisted instruction.

The aims of this paper are :

- to relate a training experience with a group of secondary sciences teachers ;
- to analyze the training process in a systemic approach.

The training experience concerned fourteen secondary teachers for one year. Five applications were developed at the end of the training. The objectives were simultaneously pedagogical and technical : " to train oneself to develop applications and develop applications to train oneself".

These points will be considered :

- The role in the training of trainers of "personal constructs";
- The trainer of teachers and his particular "accompanying teachers" function ;
- Development process as analyzer of teachers ' practice.

I. THE TRAINING EXPERIENCE¹

The aim of this training experience was, to favor integration of application softwares as learning tools, by secondary sciences teachers in their practices.

We chose a double strategy : "to train oneself to develop applications and develop applications to train oneself".

The side : "to train oneself to develop applications " included the following aims :

- to give opportunities to teachers to initiate themselves into computer science literacy and into database management system and spreadsheet uses ;
- during the development process, to research, to explicit the integration conditions of the softwares in the teaching practices.

The side : "develop applications to train oneself" included an objective which seems to be essential for the appropriation of the innovation : the development of the ability of analyzing one's practice.²

This ability includes:

- to size up the efficiency of the innovation in relation to one's actual practice;
- to theorize, in other words to utilize theoretical models to speak about, to explicit his own practice;
- to propose modifications and to value his hypotheses.

These abilities involve an important affective side :

- to stand back from his functions ;
- to keep separated his personality from his job modifications.

Furthermore, the following propositions explain why we chose application softwares and their uses as learning tools for the classroom. Firstly , it appears that learning programming seems to be a hard task for those who do not teach computer science and postpone too far pedagogical applications. Secondly, the traditional computer assisted instruction softwares are not easily available in Belgian schools.

In opposition, application softwares like word processing softwares, data base management systems and spreadsheets are available. Moreover, an elementary technical training done, teachers could create applications and produce pedagogical sequences in which applications softwares could be used as learning tools.

The training experience lasted twenty-five days and involved two stages :

- ten days were devoted to technical training : general computer science introduction and application softwares uses.
- thirteen days were used for working groups with the aims of developing softwares for sciences learning and integrating the computer as a tool in teachers ' practice.

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¹ Trainers involved in this experience were : C. Duchâteau, A. Delacharlerie, J. Brüll-Guillaume, B. Hauglustaine-Charlier.

² Also developed by J. Donnay in "Quelques hypothèses de compétences favorables à l'adoption des nouveaux médias par le formateur", Cedelap, Berlin, 1989.

Three steps were included in the developing process :

1. Analyses :
Questions like : "Which learning ?", "Which knowledge ?", "How ?", "In which teaching and learning contexts ?", were discussed in the working groups.
2. Pedagogical sequences design :
The objectives, the pedagogical sequence including learners ' activities, other media, experimental materials and teachers ' behaviors were determined.
3. Technical development :
Teachers helped, by the trainers, had developed the softwares.

These steps didn't follow a linear sequence, a lot of back and forward movements were necessary . A reason for this was for instance, that the first stage; analysis, didn't seem significant enough for the teachers who were initially interested by technical productions.

In this development process, our trainers job was an "accompanying function" for those teachers. We wanted :

- to provide theoretical models following demands to help teachers to analyze their own practice;
- to furnish technical aids;
- to help teachers in the assessment of the pedagogical sequences.

II. ANALYSES

The trainer of teachers have to manage a lot of elements which interact in a system. J. Donnay³ considers five great variables included in the institutional context : the subjects, the learners, the educational environment and their binary and ternary intersections. The whole system changes and requires the account of time. In our analyses, we consider one part of the subject matter : the informatics tools, some characteristics of the learners : their personal constructs, an element of the educational environment : the trainer of trainers in his "accompanying" role.

- The role of "personal construct" in the training of trainers

Persons, situations, projects and moment determine "personal constructs". They have two facets : cognitive and affective.

We consider here "personal constructs" of teachers, such as they were expressed during the development process.

In this paper, we will analyze a personal construct which seems to be interesting to analyze for teachers and also for trainers of teachers : "the computer as tutor". According to this construct, the computer could realize (automatically) some teaching functions like : instructions, questions, feedback, and, could be a substitute for the teacher. This construct was expressed by nearly all the teachers, even by those who had no experience about CAI, during the first stage : analyses. But also during the technical development when for instance, teachers working with databases required to introduce help sequences linked to some learners ' questions. The expressions of this construct gave possibilities to teachers and trainers to explicit their own constructs and theories and to research other possibilities. In our example, the "computer as tutor" shows :

1. A "Personal construct" about knowledge

A construct for which, the knowledge exists out of people and is static. As caricature, "the person doesn't know anything by oneself, knowledge comes from the world". Beside this construct which is often implicitly present by teacher, it was possible to explicit other constructs about knowledge. And for example, a more constructivist view for which knowledge is an individual construction. This dynamic construction process links in interaction interiority and exteriority.

2. A "Personal construct" about learning.

The "computer as tutor" is the occasion to explicit with a teacher his constructs about learning. And in this case, a construct for which learning could be a reception process. The metaphor of "soft wax moulded by an exterior model" corresponds with this construct. For the learner, the essential would be to get enough good, structured and pretty material. It is also a construct for which the benefits of peers ' interactions are not

³ J. Donnay, op. cit..

considered. Once more, it was possible to explicit, for instance, a conception for which learner constructs his knowledge by interacting with a rich pedagogical environment including computers and softwares but also other learners, teachers, video films, slides, books.

3. A "Personal construct" about teachers' functions

The "computer as tutor" reveals to the teacher, his personal constructs about his function too. And, for instance, an instructor or tutor function. The teacher would be the only source of information and training media would be considered as substitutes. Beside this construct, the design of pedagogical sequence including an open-learning tool like a spreadsheet or a database management system was the occasion to induce teacher to consider himself as a manager of the pedagogical environment.

- Application softwares as analyzers

During those analyses, the computer and the application softwares were analyzers or "mirrors" of the teacher's personal constructs. The design of pedagogical uses of application softwares could be an analyzer for teacher's practice because application softwares are open learning tools.

They don't induce a specific learning or teaching strategie, they could be used in different contexts : lectures, working-groups, laboratories...so teachers could use them as they like according to their own habits, their own practice, their own constructs.

- Trainers of teachers in their "accompanying" function

In the previous section, we speak about our function as an "accompanying" function during the development process. This function is not easy and requires to consider several elements and for example :

- the position of the trainers out of teachers' practice conducts trainers easily to a technical role;
- the trainers functions must be sufficiently explicit;
- software applications could be simple enough and would not require too many technical knowledge;
- material purpose of the training : to "produce realizations" could become the first one.

But the most difficulties were that teachers would not easily accept to analyze their practices and the ruptures linked to the use of a new media. During the training process, we lived a lot of back and forward movements. Teachers seemed to explicit and theorize their constructs and researched other pedagogical uses of application softwares. Some days later, they required to change their project. In this case our trainer's function was to manage affective and cognitive resistances. Our function was not to impose norms but principally to help teachers to explicit their own constructs and to choose.

III. CONCLUSIONS

In the described training system , pedagogical design of pedagogical uses of application softwares as "mirror" for teacher's personal constructs seems to be an essential part.

It isn't an original function, this role has been played by other training media in the past.

But perhaps, this function is easier here, because :

- application softwares seem to be "open-learning" tools ;
- application softwares are more users friendly ;
- design of pedagogical sequences with application softwares drives rapidly teachers before pedagogical questions.

The developing process represents also a training for trainers of teachers.

We hope that your questions and feedback will continue this process.